

What is Claimed is:

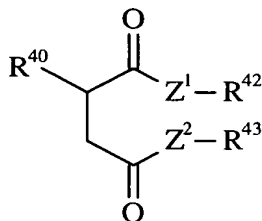
1. A polymerizable system comprising:

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(a) an organoborane;

(b) at least one polymerizable monomer; and

(c) a work-life extending agent according to the general formula:



wherein R⁴⁰ is CH₂= or alkenyl, Z¹ and Z² are independently O, N- R⁴¹ or S, and R⁴¹, R⁴² and R⁴³ are independently H, alkyl, aryl or cycloalkyl, provided that when Z¹ and Z² are O, R⁴² and R⁴³ are independently alkyl, aryl or cycloalkyl.

2. The polymerizable system of claim 1 wherein R⁴² and R⁴³ are butyl, and Z¹ and Z² are O.

3. The polymerizable system of claim 1 wherein R⁴⁰ is vinyl.

4. A polymerizable system comprising:

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(a) an organoborane;

(b) at least one polymerizable monomer; and

(c) at least 2.5 weight percent of itaconic acid, itaconic acid derivatives or combinations thereof.

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5. The polymerizable system of claim 4, wherein the itaconic acid derivative comprises itaconic mono(butyl) ester.

6. The polymerizable system of claim 4, wherein the itaconic acid derivative comprises itaconic di(butyl) ester.

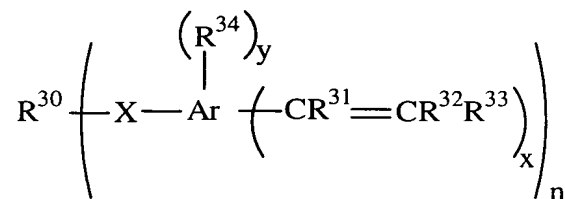
7. The polymerizable system of claim 1 further comprising a decomplexer.

8. The polymerizable system of claim 7, wherein the organoborane is complexed with a complexing agent comprising a material selected from amines, amidines, hydroxides, alkoxides, and combinations thereof.

9. The polymerizable system of claim 1, wherein the at least one polymerizable monomer comprises a material selected from (meth)acrylates, (meth)acrylamides, and mixtures thereof.

10. The polymerizable system of claim 9, wherein the at least one polymerizable monomer comprises a material selected from (meth)acrylic esters of monohydric alcohols and (meth)acrylic acid esters of polyhydric alcohols.

11. The polymerizable system of claim 1 further comprising a vinyl aromatic compound according to general formula:



wherein:

n is an integer having a value of 1 or greater;

x is an integer having a value of 1 or greater;

y is an integer having a value of 0 or greater;

Ar is a substituted aryl group;

R³¹, R³² and R³³ are independently selected from the group consisting of hydrogen, alkyl, aryl and halogen;

R^{34} is an organic group wherein each R^{34} is independently selected from the group consisting of alkyl, alkoxy, alkanoyl, alkanoyloxy, aryloxy, aroyl, aroyloxy, and halogen;

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X is a divalent organic group or a covalent bond; and R^{30} is an organic group;

wherein a total molecular weight of each X plus R^{30} is 100 or greater.

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12. The polymerizable system of claim 1, wherein the polymerizable system retains at least 85% or greater overlap shear strength after an extended open time.

13. The polymerizable system of claim 12 wherein the extended open time is between about 7 minutes and 20 minutes.

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14. The polymerizable system of claim 1 further comprising a core-shell polymer.

15. The polymerizable system of claim 1 further comprising a reactive diluent.

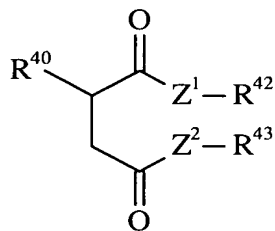
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16. A polymerizable system comprising

(a) a first part comprising an organoborane; and

(b) a second part comprising a polymerizable monomer;

wherein at least one of the first part or the second part further comprises a work-life extending agent according to the general formula:



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wherein R^{40} is $CH_2=$ or alkenyl, Z^1 and Z^2 are independently O, N- R^{41} or S, and R^{41} , R^{42} and R^{43} are independently H, alkyl, aryl or cycloalkyl,

provided that when Z¹ and Z² are O, R⁴² and R⁴³ are independently alkyl, aryl or cycloalkyl.

5 17. The polymerizable system of claim 16, wherein the work-life extending agent is included in the second part.

18. The polymerizable system of claim 16 wherein the organoborane is complexed with an amine.

10 19. The polymerizable system of claim 16, wherein the work-life extending agent is itaconic di(butyl) ester, and the itaconic di(butyl) ester is included in the second part.

20. The polymerizable system of claim 16, wherein the organoborane is complexed with an amine and the second part further comprises a decomplexer.

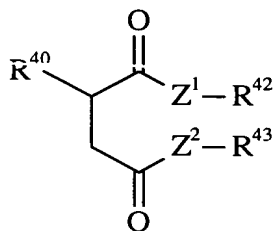
5 21. The polymerizable system of claim 16, wherein the first part and the second part are combined in a whole number ratio of about 1:10 to about 1:1.

20 22. A polymerizable system comprising:
(a) an organoborane;
(b) at least one polymerizable monomer; and
(c) about 8 weight percent itaconic di(butyl) ester.

25 23. A method of increasing the work-life of a polymerizable system comprising an organoborane and a polymerizable monomer, the method comprising adding itaconic acid, itaconic acid derivatives, or a combination thereof in an amount sufficient to provide an initial concentration of the itaconic acid, one of itaconic acid derivatives, or a combination thereof of at least 2.5 weight percent of the polymerizable system.

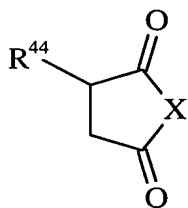
30 24. A polymerizable system comprising:
(a) an organoborane;

- (b) a complexing agent comprising a material selected from amines, amidines, hydroxides, alkoxides, and combinations thereof;
- (c) at least one polymerizable monomer; and
- (d) a work-life extending agent according to the general formula:



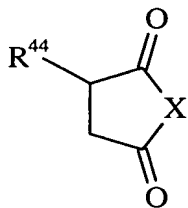
wherein R^{40} is $CH_2=$ or alkenyl, R^{42} is H or alkyl, R^{43} is H, and Z^1 and Z^2 are O and the ratio of amine-, amidine-, hydroxide- or alkoxide-reactive groups in the work-life extending agent to amine, amidine, hydroxide or alkoxide groups in the complexing agent(s) is over 3.0:1.0.

25. A polymerizable system comprising:
- (a) an organoborane;
- (b) at least one polymerizable monomer; and
- (c) a work-life extending agent according to the general formula:



wherein R^{44} is $CH_2=$ or alkenyl and X is S or $N-R^{50}$, where R^{50} is hydrogen, alkyl, aryl or cycloalkyl.

26. A polymerizable system comprising:
- (a) an organoborane;
- (b) a complexing agent comprising a material selected from amines, amidines, hydroxides, alkoxides, and combinations thereof;
- (c) at least one polymerizable monomer; and
- (d) a work-life extending agent according to the general formula:



wherein R⁴⁴ is CH₂= or alkenyl and X is O and ratio of anhydride groups in the work-life extending agent to amine, amidine, hydroxide or alkoxide groups in the complexing agent(s) is over 3.0:1.0.

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